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Population Size and Movements of Spotted Salamanders at South Holston Dam, Sullivan County, Tennessee.

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by
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ABSTRACT

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by
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In the Southern Appalachians, there are growing concerns about Spotted Salamanders (*Ambystoma maculatum*) due to habitat destruction and the uncertain future of their forested riparian habitat. In this study, I establish baseline data of a population of Spotted Salamanders so future monitoring of this population can be performed. The study site is located in northeastern Tennessee, just east of the city of Bristol. It is a vernal pond at the Osceola Island Recreation Area one mile below the South Holston Dam on Holston View Dam road. A drift fence was established completely around the perimeter of the vernal pond to capture Spotted Salamanders entering and exiting the study pond. Individual Spotted Salamanders were identified using spot pattern recognition. An estimated population size of 2,449 Spotted Salamanders was determined to use the pond for breeding for the spring of 2003.

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CHAPTER 1

INTRODUCTION

Recent work has suggested that amphibian populations are declining worldwide and much attention is focused on identifying biotic and abiotic causal agents (Muths et al. 2003). In addition to identifying agents responsible for declines, there is a need to identify at-risk populations in a timely fashion so that intervention is possible. Many times this is done by monitoring the size of individual populations (Heyer 1994). Often this is difficult because there is no baseline information on a certain population's size. If there is no initial information to compare current data with, no insightful conclusion can be extrapolated. In the Southern Appalachians, there are growing concerns about Spotted Salamanders (*Ambystoma maculatum*) due to habitat destruction and the uncertain future of their forested riparian habitat (http://sunsite.utk. edu/samab/). In this study, I establish baseline data of a population of Spotted Salamanders so future monitoring of this population can be performed.

The genus *Ambystoma* contains some of the largest terrestrial salamanders in North America. The adults have rounded heads, conspicuous costal grooves, and functional lungs, but lack nasolabial grooves. Larvae are aquatic and have a broad head with three pairs of bushy gills and a well-developed caudal fin.

Spotted Salamanders are a relatively large *Ambystoma* with a snout-vent length (SVL) of 7 – 12 cm. They have two irregular rows of large yellow or yellowish-orange spots extending from the head to the tip of the tail on a gray to black dorsum. The sexes can be distinguished during the breeding season by observing the animal's vent. The male's vent is conspicuously swollen compared to the female's vent, so accurately sexing the animals morphologically is easy.

Spotted Salamanders range in portions of southeastern Canada and throughout much of the eastern United States. They inhabit deciduous and mixed coniferous-deciduous forests where suitable breeding sites are available. In late January to early March, adults migrate to vernal, fishless ponds to breed. Spotted Salamanders can have an average migration distance of 125 meters (Semlitsch 1998) and migration distances of over 200 meters have been documented (Petranka 1998). Males deposit spermatophores on twigs or blades of grass along the edge of the pond. The male then nudges a willing female with his head and guides her to the position of the spermatophore where she picks it up with her cloacal lips. After mating has occurred, the female will deposit an egg mass in the pond. The adults remain in the pond for 30 - 45 days and return to their fossorial life in the forest. After 4 - 7 weeks of developing, the eggs hatch. In late summer, after 8 – 10 weeks, the aquatic larvae metamorph into juvenals and leave the breeding pond and become fully terrestrial animals. They will reach sexual maturity after 3 – 5 years and can have a life span of more than 20 years (Petranka 1998).

The objectives for this study were to determine the population size of adult Spotted Salamanders that use the study pond for breeding (establishing baseline), to identify individual animals for mark-recapture, build a catalog of data on individual Spotted Salamanders to be used as a reference for future studies of this population, and to determine the general direction from which adults are migrating.

CHAPTER 2

MATERIALS AND METHODS

The study site is located in Sullivan County, Tennessee, just east of the city of Bristol. It is a vernal pond at the Osceola Island Recreation Area one mile below the South Holston Dam on Holston View Dam road. In 1992 the Tennessee Valley Authority (TVA) scooped out soil across the road from Osceola Island to fill in the area that would become the parking lot at the recreational area. By doing this, TVA inadvertently created a vernal pond that is about 900 feet in circumference in the late winter but dries completely by the end of summer. A mixed coniferous-deciduous forest borders one side of the pond, while the other side is bordered by a treeless field that is maintained by TVA to hold back succession and is 60 feet from the road. It has now become an established breeding site for Spotted Salamanders and a Tennessee amphibian monitoring area.

As has been done for other Spotted Salamander studies (Regosin et al. 2003), a drift fence was established completely around the perimeter of the vernal pond. The drift fence was installed 2 –5 meters from the high water mark of the pond to intercept all individuals moving to and from the pond. The drift fence consisted of a 50 cm silt fence made of woven nylon mesh and was buried 8 cm in the ground while held in place with wooden stakes. Pitfall traps were installed at approximately every 110 feet along the drift fence. At each trap location, a single pitfall trap was placed on each side of the fence for a total of 16 traps and each trap was flagged with a number (trap 1, trap 2, etc.) (figure 1). Pitfall traps were made from large tin coffee cans 15 cm in diameter and 15 cm deep.

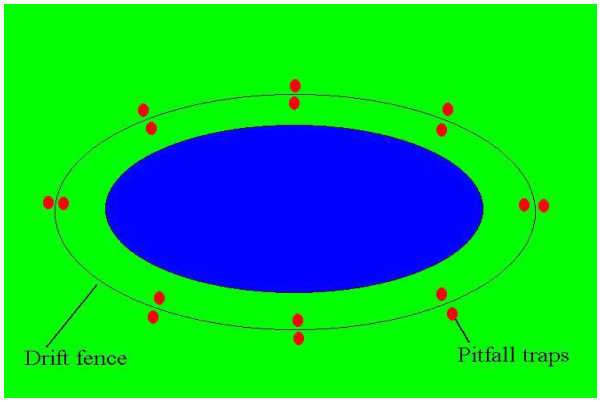

Fig. 1. Diagram of vernal pond with drift fence and pitfall traps.

Traps were monitored from February 10, 2003 to May 19, 2003. Monitoring took place on all rainy or foggy nights from dusk to dawn when the temperature was above freezing. Traps were opened at night and closed during the day. Approximately, 140 hours were spent monitoring the traps. All Spotted Salamanders collected were removed from the study site and taken to my home, measured (SVL) to the nearest 0.5 cm, weighed to the nearest 0.5 gram, and returned to the study pond the next day. Gender, trap number, and spot pattern were also documented for each individual and a digital photograph was taken of the animal. A compact disc with all photographs will be filed with the thesis.

When a monitoring project is such that animals are sampled on only two occasions with mark-recapture methods, then the Petersen estimate must be used to determine population size (Heyer 1994). The Petersen estimate of population size N is given by $N=rn/m$ where r is the number of animals initially caught, marked, and released; n is the total number of animals caught the second time; and m is the total number of marked animals caught the second time (Heyer 1994). A chi-square test was performed on the number of Spotted Salamanders caught at each trap when entering and exiting the study pond. This was done to determine if there was bias in the direction of the salamanders' movements or if movement was evenly distributed. The

computer software MINITAB® was used to perform a 2-sample t-test to determine significance between the mass and SVL of the male and female Spotted Salamanders from when they entered and exited the study pond.

The spot pattern was described and documented based on a technique described by Patrick Loafman (Loafman 1991), which identifies individual Spotted Salamanders by their spot pattern. Each animal's spot pattern is described as the total number of spots found on defined parts of the body. For this study, a spot is defined by any area of yellow to yellowish-orange pigment that is completely surrounded by the dark gray to black background on the dorsum of the Spotted Salamander (figure 2). Nine defined areas of the body were used to describe the spot pattern of each animal in this study. The head is broken down into four distinct regions. The gular fold, the fold between the angle of the jaws, and an imaginary line down the center of the head defines the head as front left, front right, rear left, and rear right (figure 3). The neck area is defined as the area between the gular fold and the first costal groove posterior to the forelimbs. The neck is further broken down as areas on the left and right side of the vertebra column. The snout-vent (SV) spots are also recorded and defined as the area from the tip of the snout to the posterior end of the cloaca and spots on the left and right side are recorded. Finally the total number of spots on the tail are recorded and defined as the area from the posterior end of the cloaca down to the tip of the tail. Spots on the legs and feet are not considered. If any spots fall directly on the boundary, then the spot number is 0.5 for each side of the boundary. Spots are documented from the left to right side of the animal's body and front-left, front-right, rear-left, and rear-right for the head (figure 4).

Fig. 2. Yellow areas represent two spots.

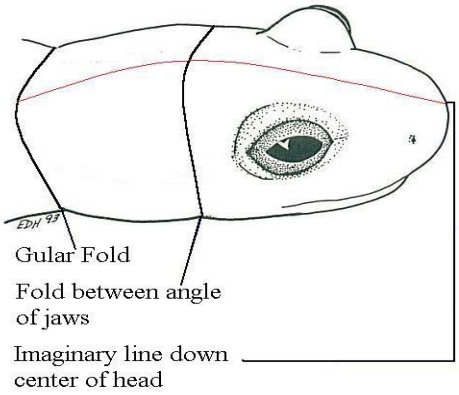

Fig. 3. Diagram of defined sections of the head

Fig. 4. Summary of spot count for an individual Spotted Salamander: Head = 1.5,0.5,1,2 Neck= 2,1 SV= 11.5,9.5 Tail= 8

CHAPTER 3

RESULTS

Spotted Salamander movements were observed from 2-16-03 to 3-15-03 and 661 Spotted Salamanders were documented and photographed at the site (Appendix). There were 526 individuals entering the pond and 135 individual exiting the pond. There were 29 recaptures exiting the pond. The Petersen estimate gives a population size of 2,449 Spotted Salamanders with a standard error of 402 that used the pond for breeding for the spring of 2003 (table 1). The ratio of male to females Spotted Salamanders entering the study pond was 1.7:1 and the ratio for Spotted Salamanders exiting the pond was 1.2:1. However, the sex ratio for the recaptured group was 1:6.

The average mass of the males entering the pond was 17.64 grams and 16.46 grams exiting the pond. The average mass of the females entering the pond was 26.99 grams and 20.50 grams exiting the breeding pond. The 2-sample t-test showed significant difference in mass in both males and females when entering and exiting the study pond (table 2)(table 3). The average SVL of males entering the pond was 8.5 cm and 8.3 cm exiting the pond. The average SVL of females entering the study pond was 9.5 cm and 9.3 cm exiting the pond. The 2-sample t-test showed no difference between the SVL of males entering and exiting the pond or females entering and exiting the pond.

Table 1. Formula for the Petersen estimate and standard error.

Estimator	Formula	
Petersen	$N = \frac{r\,n}{m}$	2,449
Standard Error for Petersen	$SE = \sqrt{\frac{(r^2 n(n-m))}{m^3}}$	402

Table 2. Mass of male Spotted Salamanders entering and exiting the breeding pond. Data are mean ± standard deviation.

	N	Mass (grams)
Males Entering	328	17.64 ± 3.63
Males Exiting	71	16.46 ± 3.28
P-Value		0.012

Table 3. Mass of female Spotted Salamanders entering and exiting the breeding pond. Data are mean ± standard deviation.

	N	Mass (grams)
Females Entering	191	26.99 ± 4.84
Females Exiting	68	20.50 ± 3.42
P-Value		< 0.001

Chi-square analysis showed bias in direction of movement entering and exiting the study pond. The chi-square values of the number of Spotted Salamanders caught in each trap entering and exiting the pond are 490.12 and 112.74 respectively, and the p-level value for 5% is 14.07. There was more movement entering and exiting the pond in the field area and the area facing the road (figure 5).

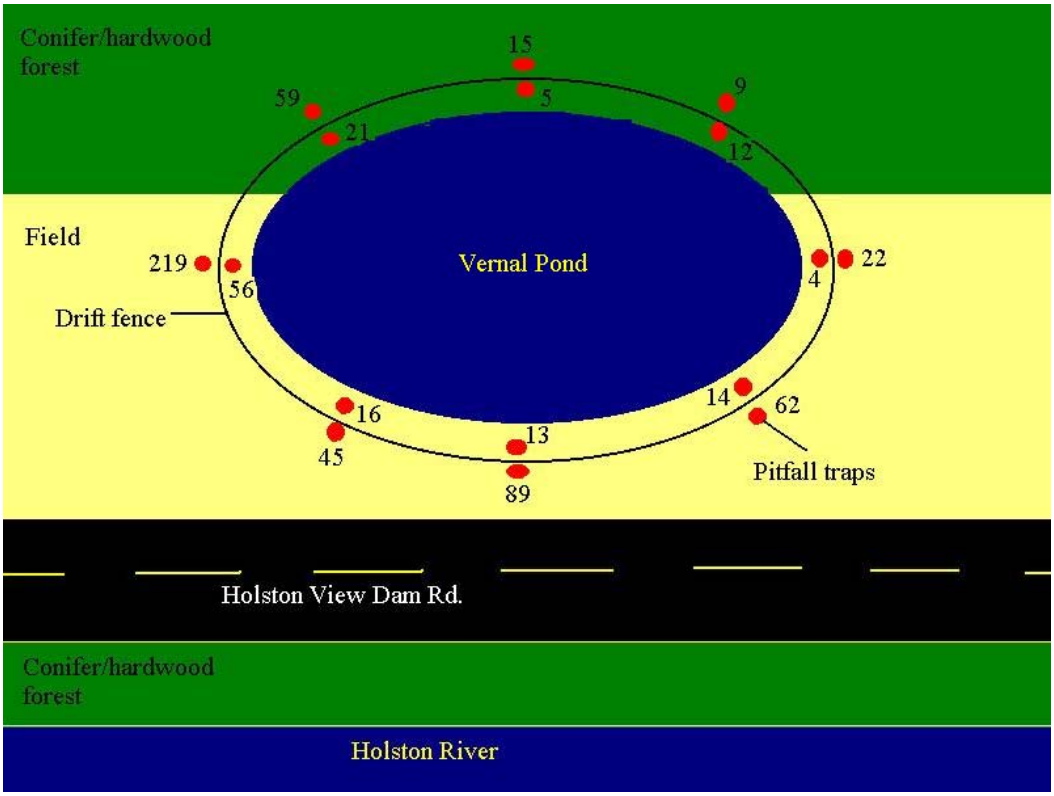

Fig. 5. Diagram of study site with the number of Spotted Salamanders captured from each pitfall trap.

CHAPTER 4

DISCUSSION

The low number of recaptured salamanders was quite surprising due to the entire study pond being completely encircled by the drift fence. Salamander loss due to predation is not likely because Spotted Salamander predation is rare due to their unpalatable noxious mucus secretions (Petranka 1998). Drift fence leakage was the most likely issue. There are several different possibilities that could have contributed to this. Individuals could have climbed over the fence; however, this was never observed during monitoring. Individuals could have crawled through areas where two sections of the drift fence meet, although these areas were sealed with duct tape. Individuals could have also used mole tunnels to travel under the drift fence. I believe this to be the most likely scenario. There were numerous mole tunnels observed at the study site and mole tunnels can be found at a depth of up to 24 inches (http://www.esf.edu/aec/adks/mammals/starnosed_mole.htm). Spotted Salamanders appear to be unable to excavate their own burrows (Semlitsch 1983) and often inhabit small-mammal burrows (Madison 1997). Recent studies show that Spotted Salamanders use small-mammal burrows as conduits to migrate to breeding ponds and that Spotted Salamander densities during migration are dependant on the densities of small-mammal burrows (Regosin et al. 2003). Although the method of drift fence/pitfall traps is often used in capturing Spotted Salamanders, it may not be an effective method in capturing all migrating individuals (Jenkins 2003). The sex ratio of males to females in breeding ponds is always male biased (Petranka 1998). This coincides with the sex ratios of individuals entering and exiting the breeding pond in my study. However, the sex ratios of

individuals recaptured do not show this trend. This could be attributed to the small sample size of recaptures.

The population size estimate was 2,449 adult Spotted Salamanders. This is comparable to other population size studies I could find. A study was performed at a wetland complex near Penn State. The wetland consisted of 13 vernal pools and had adult Spotted Salamanders using them for breeding. The population size of adult Spotted Salamanders there ranged from 387 to 13,665 (http://www.pti.psu.edu/mautc/docs/MA-III-0016.pdf). Another Spotted Salamander population size study at seven vernal ponds in the Cape Cod National Seashore had population size estimates ranging from 100 to 1265 breeding adults (science.nature.nps.gov/ im/monitor/protocols/caco_amphibians.pdf). No similar study in the Southern Appalachians could be found for comparison.

The mass of male Spotted Salamanders decreased significantly from the point of entering the pond to exiting the pond. The mass of the females also decreased significantly after exiting the breeding pond. A decrease is to be expected because adults do not feed until after exiting the breeding pond (Petranka 1998). Females will lose more mass than the males as a result of depositing their egg masses, while males deposit small spermatophores. The observed results coincide with other studies (Petranka 1998).

Loafman's spot pattern recognition technique had a 100 percent success rate. All recaptured salamander's spot pattern matched exactly with their initial documented spot pattern. Spotted Salamanders captured exiting the pond with similar, but not exact spot patterns as those entering the study pond were confirmed not to be the same salamander by examining their digital photographs.

As stated above, much of the migration activity was on the side of the pond facing the road and many road-kill specimens were observed. I am unsure why migrational direction is biased because similar habitats occur all around the study pond. If future monitoring indicates a population decline, this information could be used to persuade TVA to build a culvert under the road to allow the salamanders safe access to the breeding pond.

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APPENDIX

Appendix. Data of all Spotted Salamanders captured. SP=Spot #, HD=Head, NK=Neck, SV=Snout-Vent, T=Tail, f=Front, r=Rear, R=Right, L=Left, and PIC=Picture

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. f.L.	SP. HD. f.R.	SP. HD. r.L.	SP. HD. r.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	10.5	7	1	0	2	2	0.5	2	8	10	5	2	3-4
M	14	8	1	0	2	1	1	1	9	8	8	4	3-4
M	10.5	7	1	2	2	1	1	1	10.5	9.5	6	5	3-4
M	15	7.5	1	1	1	1	0	1	6.5	7.5	7	6	3-4
M	18.5	8	1	1	2	3	2	1	13	13	12	13	3-4
M	22	8.5	1	1	2	1	1	1.5	12	10	9	14	3-4
M	22	9	1	1	1	1	1	1.5	8	11	7	15	3-4
M	15	8	0	1	2	3	2	1	11	12	11	16	3-4
M	17	9	2	1	1	2	2	1	11	12	14	17	3-4
M	20	9	1	1	2	2	1	0.5	11	8	8	19	3-4
M	20	9	3	1	1	2	1	0	11	9	9	21	3-4
M	15	7.5	1.5	1	1.5	1	0	0.5	8	8	7	22	3-4
M	13	7.5	1	1	2.5	2.5	1	2	11.5	12.5	12	23	3-4
M	18.5	8.5	2	1	3	1	1	1.5	13	10	9	27	3-4
M	21.5	9	2	2	2	2	1	2	13	12	12	28	3-4
M	20	9	0	0	2	1	1	1	8.5	6.5	9	29	3-4
M	15	7.5	3	1.5	3	2.5	1.5	1	15	15	16	31	3-4
M	21.5	8.5	1	1	1	1	2	1	16	13	8	1	2-16
M	22	9	1	1	1	1	1	1	9	9	10	2	2-16
M	22	8.5	1	1	1	2	1	1	9	10	7	3	2-16
M	19	8.5	2	3	1	2	1	1	10.5	13.5	13	8	2-16
M	16	7	0	0	1.5	1.5	0	1	5.5	6.5	5	9	2-16
M	17	8	1	1	2	1	1	0	11	9	10	12	2-16
M	19.5	8.5	1	0	1	2	1	1	10	10	7	167	2-21
M	18	8.5	1	1	2	1	1	1	9.5	8.5	7	169	2-21
M	11	7	1	2	1	1	1	1	11	10	9	172	2-21
M	15	7.5	1.5	1.5	1	1	1	1	9.5	9.5	8	173	2-21
M	20	9	1.5	1.5	2	2	1	1	11.5	11.5	14	174	2-21
M	19.5	8.5	1	1	2	1	1	1	10	7	9	179	2-21
M	18.5	8.5	3	3	3	3	1	1	15	15	13	180	2-21
M	20	9	1	0	1	1	1	1	9	8	8	181	2-21
M	19.5	8.5	1	1	2	2	1	1	10	12	8	183	2-21
M	18	8.5	1	1	1.5	2	1.5	1.5	10.5	9.5	8	184	2-21
M	21.5	8.5	1	1	2	1	2	1.5	10.5	9.5	10	185	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	18	8.5	0	1	2	1	1	0	9	9	7	187	2-21
M	17	8.5	1	1	1	2	1	1	8.5	9.5	9	190	2-21
M	20	9	2	1	2	2	1	1	14	12	11	191	2-21
M	18	8	1	1	1	1	1	1	10	9	10	193	2-21
M	22.5	9	1	2	2	1	1.5	1.5	12	13	7	194	2-21
M	16	7.5	1	1	2	1	2	1.5	10	9	9	195	2-21
M	19	8	0	0	3	1	1	1	10	7	5	196	2-21
M	15	8	0	0	2	2	1	1	9	10	8	197	2-21
M	20.5	9	0	2	2	2	1	1	12	11	10	198	2-21
M	15	8	1	1	1	2	0.5	0.5	9	9	9	202	2-21
M	20	9	1	2	2	2	1	1	12	10	12	205	2-21
M	15	8	1	1	2	2	1	1	10	10	12	206	2-21
M	14	7.5	1	1	1	2	1	1	9	10	7	209	2-21
M	12	8	1	0	2	2	1	1	11	9	5	212	2-21
M	22	9.5	1	1	1	1	1	1.5	8	11	7	213	2-21
M	20	8.5	2	1	1	1	1	1	9	8	6	215	2-21
M	19	9	0	0	1	3	2	1	9	12	12	218	2-21
M	18	9	2	2	1	2	1	1	12	14	13	219	2-21
M	18.5	8.5	1	1	2	1	0.5	1	9	9	8	221	2-21
M	12	8	1.25	1.25	3.25	2.25	1	1	10.5	8.5	6	223	2-21
M	18	8.5	1	1	1	1	2	2	9	10	8	224	2-21
M	24	9	1.5	1.5	4	1	1	1	13.5	9.5	12	225	2-21
M	19	8.5	1.5	2	2	2.5	2	1	8.5	10.5	8	226	2-21
M	19.5	9	1	1	1	1	1	1	9	9	9	227	2-21
M	17	8.5	0	0	2	1	0	1	7	8	9	229	2-21
M	21	9	1	2	2	1	2	1	10	10	8	233	2-21
M	22	9	0.5	0.5	2	1	1	0	10.5	6.5	9	234	2-21
M	11	7	1	3	2	1	0.5	1	10	11	7	235	2-21
M	18	8.5	2	2	2	2	1.5	1	12.5	10.5	10	236	2-21
M	13	7.5	1	1	1	1	1	1	8	8	6	238	2-21
M	21.5	9	0	0	2	2	1	1.5	8	9	6	242	2-21
M	9.5	7	1	1	2	1	1	1	10	9	9	245	2-21
M	22	9	0	0	2	2	0.5	1	9	8	10	248	2-21
M	23	8.5	1	2	2	1	2	2	12	16	16	250	2-21
M	12	7.5	1	1	1	2	1	1	7	11	10	253	2-21
M	20	8	1	1	1.5	2	1.5	1	9	9	11	254	2-21
M	19	8.5	0	0	1	2	1	1	7	9	11	255	2-21
M	15	8	1	1	2	2	1	1	8.5	9.5	12	256	2-21
M	17.5	8.5	1	1	2	2	1	1	9	10	8	257	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	21	8.5	1.75	1.75	2.25	1.25	2	0.5	13	10	11	259	2-21
M	15.5	7.5	1	1	1	2	1	2	9	11	7	260	2-21
M	16.5	8	0.5	0	2.5	1	1	1	12	8	11	262	2-21
M	16	8.5	1	1	1	1	0	1	8	11	10	263	2-21
M	14	7.5	0	0	1	1	1	1	8	7	5	265	2-21
M	18	9	0	1	2	1	1	2	10	12	10	266	2-21
M	13	7.5	0	1	2	2	2	1	9.5	8.5	5	268	2-21
M	19	8	1	0	1	2	1	1.5	12.5	10.5	13	287	2-21
M	17.5	8	1	1	2	2	2	1	12	10	8	290	2-21
M	20	9	1	1	2	2	1	1	11	12	11	292	2-21
M	14.5	8	0	1	1	1	1	0	6.5	6.5	6	300	2-21
M	19.5	8	0.5	1	1.5	2	1	1.5	8	9	7	303	2-21
M	17.5	9	0	1	2	2	1	1	8	10	10	304	2-21
M	27	9	1	1	1	2	1	1	11	12	14	308	2-21
M	24	9.5	0	1	3	2	1	2	10	13	7	309	2-21
M	22.5	9	1	0	1	1	0.5	1	8	8	11	310	2-21
M	14.5	8	2	1	1	2	1	1	12	9	9	313	2-21
M	21	8.5	1	1	1	1	1	1	10	8	9	314	2-21
M	19	8	2	1	1	1	2	1	12	9	11	315	2-21
M	22	8.5	1	1	2	1	2	1	11	12	13	316	2-21
M	25.5	8.5	1	1	2	2	1	1	10	10	13	317	2-21
M	21	8.5	1	0	1	1	0	1	6	4	8	319	2-21
M	18	9	1	1	1	1	1.5	1.5	9	9	9	320	2-21
M	19	8.5	1	1	1	2	1	1	10	9	8	321	2-21
M	17	8.5	0	1	2	1	1	1	7.5	6.5	8	322	2-21
M	15	8	1	1	1	2	1	1	11	13	10	324	2-21
M	20	8.5	1	0	1	2	0	1	8	6	7	325	2-21
M	20	9	0.5	1.5	2	2	1	0.5	10.5	10.5	7	326	2-21
M	23.5	9	0	0	1	2	1	0	6	6	13	327	2-21
M	16	8.5	1	1	2	2	1	2	12	11	12	328	2-21
M	14	8	0	1	2	3	1	1	7	10	8	330	2-21
M	19	8.5	1	1	2	1	1	0.5	10.5	8.5	6	331	2-21
M	14.5	8.5	1	1	2	1	1	1.5	9	9	7	334	2-21
M	15	8	2	1	1	3	1	1	12	11	11	335	2-21
M	19	8.5	1	1	2	2	1	1	12	11	15	337	2-21
M	17	8.5	1	1	2	1	1	1	9	10	10	338	2-21
M	21	8.5	1	1	2	2	0.5	0.5	10	9	9	339	2-21
M	21	8.5	4.5	1.5	2	2	1	1	9.5	10.5	10	340	2-21
M	22	8.5	2	2	2.5	2.5	1	1	15.5	13.5	12	341	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	16.5	8.5	0	0	2	3	1	1	8	10	8	343	2-21
M	19.5	8.5	0	0	2	1	1	1	13	12	9	344	2-21
M	23.5	9	1	0	1	2	1	0.5	10	9	9	345	2-21
M	12	7	1	1	2	2	2	1	16	14	8	346	2-21
M	21	9	1	1	1	2	0.5	1	8	11	8	349	2-21
M	18.5	9	1	0	2	2	1.5	1	11	8	9	350	2-21
M	16.5	8.5	1	1	2	2	1	1	12.5	12.5	11	351	2-21
M	13	7.5	1	1	1	1	0	1	8	11	8	352	2-21
M	12	7	1	1	2	2	1	1	10	10	13	353	2-21
M	13	8	0.5	1.5	2	2	1	2	10.5	12.5	7	354	2-21
M	18.5	8.5	0.5	1.5	2	1	1	2	10.5	14.5	9	355	2-21
M	10.5	7.5	1	1	1	2	1	1	9	10	5	356	2-21
M	12.5	7.5	0	0	2	2	1	1	11	9	8	358	2-21
M	12	7.5	1	0	1	1	1	1	7	7	6	359	2-21
M	19.5	9	2	1	2	2	1	2	13	13	12	360	2-21
M	16.5	8	0.5	2.5	2	2	0.5	1	10.5	12.5	8	368	2-21
M	12	7.5	1	1	1	2	1	1	8	9	6	1	2-21
M	17	8.5	1	1	2	2	1	1	11	11	8	2	2-21
M	13	7.5	1	1	1	1	1	1	9	10	9	3	2-21
M	17	8.5	1	1	2	3	1	1	12	12	9	4	2-21
M	21	9	1	1	2	1	1.5	1	9	9	9	5	2-21
M	19.5	8.5	1	1	1	1	0.5	1	9	9	8	7	2-21
M	17.5	7.5	1	1	2	2	2	1	12	11	13	8	2-21
M	19	8.5	1	1	2	2	1	1	12	11	12	10	2-21
M	23	9.5	2	1	1	2	1	1	15	13	7	11	2-21
M	18.5	8	1	2	2	2	1	1	9	11	11	12	2-21
M	15	8	1	0	2	1	1	1	9	8	8	13	2-21
M	18	8.5	1	1	2	1	1	1	11	10	7	14	2-21
M	19	8.5	1	1	2	1	1	1.5	11.5	8.5	9	15	2-21
M	12.5	7.5	0.5	2	1.5	1	1.5	1	7	10	10	16	2-21
M	20.5	8.5	1	1	2	2	1	1	12	12	7	17	2-21
M	18.5	8.5	0	1	1	2	1	0.5	9	10	8	19	2-21
M	9.5	7	1	0	2	2	0.5	1	9	6	7	20	2-21
M	20	9	1	1	2	2	1	1	10	9	12	24	2-21
M	18.5	9	1	1	1	1	1	1.5	9.5	9.5	9	26	2-21
M	12.5	7.5	0	1	1	1	1	1	6	9	7	27	2-21
M	20	9	1	1	1	2	1	0	11	10	10	28	2-21
M	20	8	1	1	1	1	0.5	1	10	10	11	30	2-21
M	19.5	8.5	1	1	2	1	0.5	1	11	10	10	31	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	18.5	8	1	1	2	2	1	0	8.5	8.5	11	32	2-21
M	23	9	1	2	1	1	2	1	11	10	10	33	2-21
M	19.5	8.5	0	1	2	2	1	0.5	9	6	6	34	2-21
M	17	8	1	1	2	2	0	1	10	8	8	36	2-21
M	23.5	9.5	1.5	1.5	1	1	1	1	8	9	9	37	2-21
M	24	9	1	1	2	3	1	1	9	10	8	38	2-21
M	19.5	8	1	1	1	2	1	1	11	12	15	39	2-21
M	20.5	8	1	1	2	2	1	2	13	13	14	40	2-21
M	18.5	8.5	1	1	2	2	2	2	11	9	9	41	2-21
M	11	7.5	1	0	2	1	0.5	0.5	7.5	5.5	7	42	2-21
M	16	8.5	2.25	1.25	1.25	1.25	1	1	11.5	9.5	8	43	2-21
M	10	7	1	1	1	2	1	1	9	10	6	45	2-21
M	12.5	7.5	1	0	1	2	1	1	9	10	7	46	2-21
M	12	7.5	1	2	1	2	0.5	1	9	12	8	49	2-21
M	17.5	8	1	2	1	1	0.5	0.5	8.5	9.5	8	52	2-21
M	11	7	0	0	3	1	2	1	16	10	17	53	2-21
M	15	8	0	1	2	3	1.5	0.5	11	12	11	55	2-21
M	19	8.5	0.5	0.5	2	2	1	0.5	8.5	8.5	13	56	2-21
M	14.5	7.5	1	1	2	2	1	1	9	9	9	57	2-21
M	20	8.5	2	1	1.5	2	1	0.5	9.5	7.5	11	58	2-21
M	11.5	7.5	1.5	2.5	1	1	1	1	7.5	9.5	10	62	2-21
M	17	8.5	3.5	2.5	1	2	1.5	1	12	14	8	63	2-21
M	18	8.5	1	1	2	1	0.5	1	11	10	8	64	2-21
M	15	8	0.5	0	1.5	1	1	1	8	6	8	66	2-21
M	15	8	1	1	1	1	1	0	9	7	9	67	2-21
M	20.5	8.5	1	1	2	1	1	1	10	8	9	72	2-21
M	17	8.5	1	1	2	2	1	1	9	9	16	73	2-21
M	14	8	1.5	1.5	2	1	1	1	10.5	8.5	6	74	2-21
M	13.5	7	1.5	1.5	1	1	0.5	1	8.5	9.5	8	75	2-21
M	18	8	0.5	0.5	1	2	1	1	5.5	7.5	2	76	2-21
M	22	8.5	0	0	2	1	1	1	8	8	9	77	2-21
M	21.5	8.5	0.5	1.5	2	2	1.5	1	11.5	11.5	12	78	2-21
M	15.5	8	2	1	2	2	0.5	1	12	9	12	80	2-21
M	15	8	0	1	2	2	0	1	10	10	9	2	2-21
M	18	8	1	1	2	2	1	1	10	12	14	3	2-21
M	19	8.5	1	1	1	2	1	1	11	9	8	4	2-21
M	21	8.5	1	1	2	2	1	1	8	9	10	6	2-21
M	22	8.5	1.5	0.5	2	1	0	1	10.5	10.5	7	8	2-21
M	20	8	1	1	1	1	1	1	8	7	20	11	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	12	7.5	1	2	2	2	1	1	10	12	9	13	2-21
M	15.5	7.5	1	1	2	2	1	1	10	13	11	14	2-21
M	15	7	1	0	2	2	1	1	9	7	8	15	2-21
M	19	9	0.5	0	1.5	2	0.5	1	10	8	8	16	2-21
M	13	8	0	0	2	1	1	0	9	7	9	26	2-21
M	11.5	8	1	1	2	1	1	1	10	9	8	30	2-21
M	19	9	1	1	1	1	0	1	7	7	7	31	2-21
M	22	9.5	1.5	1.5	2	3	1	1	11.5	11.5	11	33	2-21
M	9	8	0	0	2	2	1	1	9	11	3	34	2-21
M	17	8.5	1	1	2	2	0	1	8	9	10	35	2-21
M	21.5	9	1	1	2	2	1	1	12	12	12	36	2-21
M	16.5	8.5	1	0	2	2	1	0	12	4	6	37	2-21
M	18	8.5	1	0	1	2	2	1	8	10	6	39	2-21
M	9.5	7	1	1	1	1	1	1	7.5	7.5	10	40	2-21
M	20	8.5	1	1	2	1	0	1	10	8	8	41	2-21
M	23	8.5	0	1	1	1	1	1	7	8	5	42	2-21
M	19	8.5	1	2	2	2	2	1	11	11	9	43	2-21
M	20	8.5	2	2	2	3	1.5	1.5	13.5	13.5	6	44	2-21
M	17	8	0	0	1	1	0	1	6	6	8	45	2-21
M	16.5	8.5	1	1	1	2	1	1.5	9	10	10	46	2-21
M	16	8.5	2	1	2	1	2	1	13	10	8	48	2-21
M	23	9	0	0	1	2	1	1	7	10	6	49	2-21
M	23	9	2	1	2	2	1	1	11	11	11	50	2-21
M	18.5	8.5	1	1	1	2	2	2	13	13	7	54	2-21
M	23	9.5	1	0	1	2	1	1	10	9	14	55	2-21
M	18.5	8.5	1	1	3	2	1	0.5	14	10	10	56	2-21
M	17.5	8.5	1.5	1	2.5	1	1	1	11	9	11	59	2-21
M	15	8	2	1	1	3	1	1	11	11	9	64	2-21
M	20.5	9.5	1	0	1	1	1	1	9	9	10	66	2-21
M	17.5	8.5	1	0	2	2	1	2	11	12	10	68	2-21
M	23	9	1	1	1	2	1	1.5	10.5	11.5	6	72	2-21
M	11.5	7	0	1	3	2	1	1	9	10	10	75	2-21
M	14.5	8	2	1	3	2	2	1.5	17	11	9	76	2-21
M	16	8	2	1	2	1	1	1	11.5	8.5	8	78	2-21
M	14.5	8	1.5	1.5	2	1	1	1	10.5	9.5	9	79	2-21
M	17.5	8	1	1	2	2	2	1	9	10	7	80	2-21
M	15.5	8	1.5	1	1	1	0	1	8	8	7	81	2-21
M	9.5	7	2	1	1	2	2	1	10	10	3	82	2-21
M	18.5	8.5	1.5	1	1.5	1	1	0	10.5	8.5	8	83	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	20.5	8.5	1	1	2	2	3	1	10.5	11.5	12	84	2-21
M	17.5	8.5	1	1	2	2	1	1	11	11	7	85	2-21
M	20.5	9	0.5	0.5	1	2	1	1	10.5	9.5	12	86	2-21
M	14	7	1.5	0	1.5	1	1	1	9	6	7	87	2-21
M	20.5	8.5	1	1	2	2	1	1	12	11	12	88	2-21
M	17	9	0	1	2	2	1	1	10	12	5	89	2-21
M	17.5	9	3	1	1	2	1	1	11	11	8	90	2-21
M	18.5	9	1	0	2	3	2	1	13	13	17	91	2-21
M	15	8	2	2	1	1	1	1.5	10	9	9	92	2-21
M	9.5	7	2.5	1.5	1	2	1	1	12.5	10.5	7	93	2-21
M	16	8	1	1	2	1	1	1	10	9	8	94	2-21
M	11	7	1	0	2	2	1	2	11	11	5	102	2-21
M	21.5	9.5	0	0	2	1	1	1	9	9	7	103	2-21
M	17	8.5	0	2	2	1	1	1	11	12	10	109	2-21
M	14	8	0	1	2	1	1	1	9	10	6	111	2-21
M	21	8.5	1	1	1	1	1	1	8	8	8	112	2-21
M	23	9	1	1	2	2	1	1	11	11	7	113	2-21
M	15.5	8.5	1	1	2	2	2	2	15	14	8	114	2-21
M	21	9	2	1	2	3	2	1.5	14.5	11.5	14	115	2-21
M	19.5	8.5	0	1	2	1	1	1	8.5	8.5	8	116	2-21
M	22.5	8.5	0	1	1	1	1	2	6	9	6	117	2-21
M	21	9	2.5	2.5	2.5	2.5	2	1	13.5	15.5	7	118	2-21
M	20.5	9	1	1	2	2	1	1	10	11	8	119	2-21
M	14.5	8	1	2	2	2	1	1	11	10	9	120	2-21
M	18.5	8.5	1	1	2	2	1	1	10	10	10	121	2-21
M	22	9	1.5	2	2	2	1.5	1	14	12	17	123	2-21
M	24.5	9	1	1	2.5	1.5	1	1	8.5	9	12	126	2-21
M	23	9	1	1	2	1	2	2	11	10	9	128	2-21
M	18.5	8	1	1	1	2	1	1	9	9	9	132	2-21
M	21.5	8.5	1	1	2	1	0	0	10	7	9	138	2-21
M	18.5	9	0	0	2	1	1	2	9	8	11	140	2-21
M	16	8	1	1	2	2	1	1	11	11	12	141	2-21
M	15.5	8	1.5	0.5	1	2	1	0	10.5	9.5	6	142	2-21
M	21	9	1.5	1.5	2	2	1	1	11.5	11.5	7	143	2-21
M	21	9	0	1	2	1	1	1	8	10	8	144	2-21
M	12	7	1	1.5	1	2	1	1.5	9	10	9	145	2-21
M	25	9.5	1	2	2	2	1	1	10	13	9	147	2-21
M	14.5	8	1	0	2.5	1.5	0	1	8.5	6.5	6	148	2-21
M	18	9	1	0	2	2	1	1	8	8	10	151	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	21	9	1	0	1	2	0.5	0	6	6	6	154	2-21
M	17	8.5	0	0	2	2	1	1	9	10	5	155	2-21
M	14.5	7.5	0	0	2	2	0	1	8	7	7	156	2-21
M	11	7	3.5	2	1.5	2	1	1	12	12	9	158	2-21
M	13.5	8.5	1	1	2	1	1	1	12	11	11	159	2-21
M	19	9	1	0	1	2	1	1	8	9	11	161	2-21
M	20.5	8.5	1.5	1.5	3	2	1	1.5	18.5	13.5	19	2	3-5
M	20	9.5	2	2	2	2	1	1	12	11	10	3	3-5
M	20	9	1	0	3	2	1	0.5	13	11	10	4	3-5
M	23	9	0.5	0	1.5	2	0.5	1	10	8	8	5	3-5
M	17	8	1	2	2	2	0.5	1	10	11	6	6	3-5
M	17	8	2.75	1.25	3.75	2.25	2	1	18	15	15	8	3-5
M	15.5	8.5	1	1	2	1	0.5	1	9	9	9	10	3-5
M	17	8.5	1.5	1.5	2	2	1	0.5	13.5	13.5	11	12	3-5
M	16	8	1	1	1	1	1	1	11	13	12	15	3-5
M	17.5	8	1.5	3	2	2.5	1	1.5	11	15	10	16	3-5
M	15.5	8.5	1	1	2	2	1	1	10	12	14	21	3-5
M	24	9.5	1	0	1	2	1	1	8	10	6	22	3-5
M	24	9.5	0	1	3	2	1	1	10	13	7	23	3-5
M	23.5	9	0	1	3	2	2	1.5	14	14	15	24	3-5
M	10.5	7.5	0	2	1	1.5	1	0.5	5.5	7.5	4	25	3-5
M	14.5	8	2	2	1.5	1.5	1	1	12	12	14	26	3-5
M	19	9	1	1	2	1	1	0.5	10	8	10	27	3-5
M	10.5	7	1.5	1.5	2	1	0	1	8.5	8.5	6	28	3-5
M	20	9	0	1	3	1	1	1	9	9	7	29	3-5
M	17	8	1.5	0.5	1	2	1	0.5	10.5	9.5	6	30	3-5
M	18.5	8	3	3	1	1	1.5	2	10	11	9	31	3-5
M	14	7.5	`1.25	1.25	1.25	1.25	0.5	1	7.5	7.5	8	32	3-5
M	17	8.5	1	0	2	1	1	1	10	6	7	35	3-5
M	20.5	9	0	1	2	2	0	1	9	12	11	36	3-5
M	20.5	8.5	1	2	2	3	1	1	11	14	12	37	3-5
M	16	8.5	1.5	1.5	1	3	1	1	11	12	6	38	3-5
M	21	8.5	1	1	1	1	1	1	10	9	12	39	3-5
M	17	8.5	1.5	1.5	1	2	1	1	9.5	8.5	9	40	3-5
M	15.5	8	1.5	1.5	1	2	1	1	11.5	11.5	7	41	3-5
M	20	9	1.75	1.75	2.25	2.25	1.5	1	14	11	11	42	3-5
M	13	8	2	2	2	1	1	1	12.5	10.5	19	43	3-5
M	13	8	2	1	2	3	1.5	1	14	11	12	44	3-5
M	10.5	7.5	1	1	1	2	0.5	0.5	8	9	6	45	3-5

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	15	7.5	1	3	1	2	1.5	1	10	12	8	47	3-5
M	21	8.5	1	1	2	2	0	1	11	10	10	49	3-5
M	15	8	1	1	1	1	2	1.5	10.5	9.5	7	50	3-5
M	10	7	0	0	3	1	2	1	16	10	17	52	3-5
M	16	8.5	1	1	1	2	0.5	0.5	9	10	8	53	3-5
M	19	9	1	1	1	2	0.5	0	8	11	7	56	3-5
M	18.5	7.5	1	0	2	1	2	1	9	6	5	57	3-5
M	14.5	8	1	1	2	2	1	1	8.5	9.5	13	58	3-5
M	20	8.5	1	0	1	2	0.5	0	6	6	6	59	3-5
M	20	8.5	2.5	2	3.5	3	1	1	14.5	14.5	7	60	3-5
M	16.5	9	0	0.5	2	1.5	1	1	8	9	8	63	3-5
M	14	8	1.5	1.5	1	1	0.5	0.5	9.5	9.5	8	65	3-5
M	19	9	1.5	1.5	2	2	1	0.5	11.5	11.5	7	66	3-5
M	20	9	1.25	2.25	1.25	1.25	1	0	11.5	11.5	16	74	3-5
M	21	9.5	1	0	1	2	1	1	10	9	13	76	3-5
M	15	7.5	1.5	0.5	1	1	1	1	9	8	10	77	3-5
M	20	8.5	0	0	1	0	1	1	3	2	1	79	3-5
M	17.5	8.5	0	1	2	1	1	0	10	8	10	81	3-5
M	17	8.5	0	1	2	3	1	1	10	12	11	82	3-5
M	20	9	1	2	2.5	2	1.5	0.5	15	13	12	83	3-5
M	15	8.5	1	1	1	2	1	1	10	10	8	84	3-5
M	9.5	6.5	1	1	2	1	1	1	10	8	11	85	3-5
M	19	9	1	1	1	2	0	1	8	11	8	86	3-5
M	9	7	1	1	1	2	1	1	9	10	6	87	3-5
M	16	8.5	0.5	1	1	1.5	0.5	0.5	9	9	10	88	3-5
M	12.5	7.5	1	1	2	3	1	2	10.5	11.5	7	89	3-5
M	12	7.5	0.5	1.5	2	2	1	2	10.5	12.5	7	90	3-5
M	20	9	2	2	2	2	1	2	13	12	12	91	3-5
M	11	7.5	1	1	1	2	1	0.5	9	9	8	92	3-5
M	15.5	8	1	1	2	3	2	1	13	13	12	93	3-5
M	19	9	1	1	2	1	0.5	1	10	9	11	94	3-5
M	20	8.5	1	1	2	2	2	1	11	11	10	95	3-5
M	10.5	7	1	2	1	1	1	1	11	11	8	97	3-5
M	16.5	9	1.5	1	2.5	2	2	1	13	10	8	98	3-5
M	18.5	9	1.5	1.5	2	2	1	2	13.5	13.5	11	99	3-5
M	21	9.5	1.5	1.5	1.5	1	1.5	1.5	12	12	15	100	3-5
M	20	9	0	0	2	1	1	0.5	9	8	9	101	3-5
M	21.5	9	0	0	2	2	2	2	10	10	10	102	3-5
M	18	9	1	1	1	1	1.5	1.5	8.5	8.5	10	103	3-5

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	20.5	9	1	2	3	2	0.5	1	12.5	14.5	18	104	3-5
M	20.5	9.5	1.5	2	2	1.5	1.5	1	13	13	8	106	3-5
M	16	8	1.5	1.5	1	2	1	1	9.5	8.5	10	109	3-5
M	21.5	9	1	1	2	2	0.5	1	10	9	10	110	3-5
M	12.5	7.5	0	0	2	1	1	1	11	8	8	111	3-5
M	10.5	7	1.25	1.25	1.5	1.5	1.25	1.25	9.5	9.5	7	113	3-5
M	11.5	7	1	1	2	2	1	1	9	9	8	118	3-5
M	14	8	0.5	1.5	3	3	1.5	0.5	12.5	13.5	10	121	3-5
M	17.5	8.5	1.5	1.5	2	1	1	1	12.5	9.5	11	122	3-5
M	20	9	0	0	1	1	1	1	7	10	6	124	3-5
M	17	8.5	1	1	1	1	1	1.5	8	9	7	131	3-5
M	12	7.5	0.5	0.5	1	1	1	1	6.5	6.5	6	133	3-5
M	16	8.5	0.5	0.5	1	1	1	1	6.5	7.5	6	134	3-5
M	13	7.5	2	2	2	2	1	1	11	11	9	135	3-5
M	13	8	1	1	2	2	0.5	2	11	13	11	136	3-5
M	15.5	8	1.25	1.25	1.25	1.25	1	1	10.5	10.5	10	137	3-5
M	17	8	0.5	1.5	2	1	1.5	1	11.5	12.5	13	141	3-5
M	22	9.5	1	0	1	2	1	1	10	9	7	142	3-5
M	16	8	1	0	1.5	1.5	1	1.5	10.5	7.5	7	146	3-5
M	16.5	8.5	1	1	2	2	1	1	10	10	10	147	3-5
M	15	8	1	1	2	2	0.5	1	12.5	12.5	11	149	3-5
M	10	7	1.5	1.5	1	2	1	1.5	9.5	11.5	8	152	3-5
M	15	8	2	3	2	2	1	1	13	12	10	37	3-15
M	17.5	8.5	1	1	1	2	0.5	0.5	9	9	6	38	3-15
M	16	8	1	0	1	2	1	0.5	8	9	6	40	3-15
M	16	8.5	1	1	1.5	2	1.5	0.5	10.5	9.5	8	41	3-15
M	15.5	8	2	1	3	3	0	1	12	10	5	42	3-15
M	21	8.5	1	0	2	2	1	1	10	9	8	43	3-15
M	19.5	8	1	0	2	2	1	1	11	10	10	44	3-15
M	20.5	9	1	1.5	2	1.5	0.5	1	8	10	9	45	3-15
M	21	8.5	2	1	2	2	1	1	13	9	13	50	3-15
M	13	7.5	1	1.5	1	1.5	1	1	9	9	11	51	3-15
M	14.5	7.5	1.5	1.5	1	2	1	1	12	12	7	1	3-15
M	13.5	8	0	1	1	2	0	1	8	9	6	2	3-15
M	12	7.5	0	0	1	1	1	1	7	8	9	3	3-15
M	21.5	9	2	1.5	2	1.5	0.5	1.5	11	10	10	4	3-15
M	18	8.5	1	1	1	1	1	1	10	9	12	9	3-15
M	12	7.5	1	1	1	1	1	1	9	10	9	11	3-15
M	20	9	1	1	2	2	1	1	11	11	9	12	3-15

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
M	15	8	1	1	2	2	1	0.5	11	11	9	13	3-15
M	16	8	1	0	2	2	1	1	11	9	12	16	3-15
M	17.5	8	1	1	1	1	1	1	9	10	8	20	3-15
M	18.5	8.5	0.5	1.5	2	1	1	2	10.5	14.5	9	21	3-15
M	18.5	8.5	1.5	1	2	2	1	0.5	9.5	7.5	11	22	3-15
M	22	9	1	1	1	1	1	1	7	8	7	24	3-15
M	21	9	0	0	2	1	1	2	9	9	10	26	3-15
M	17	8	1	1	1	2	1	0.5	10	8	10	27	3-15
M	18	8.5	0	0	2	1	1	1	8	8	9	31	3-15
M	18	8.5	1.5	1	1.5	1	0.5	2	9	11	10	32	3-15
M	15	8	1	2	1	1	0.5	0.5	8.5	10.5	8	33	3-15
M	16	8	1	0.5	2.5	2	1	1	12.5	10.5	10	36	3-15
F	15.5	8.5	1	1	1	2	2	1	11	10	11	34	3-4
F	32.5	10	1	2	1	2	1.5	1	9	12	8	1	3-4
F	18.5	8.5	0	0	0	0	0	0	2	2	1	7	3-4
F	22	9	3	2	1.5	2	1.5	1	10	11	10	9	3-4
F	18	8.5	0	0	2	2	1	0	8	7	7	10	3-4
F	18	8.5	0	1	2	2	0	1	6	8	7	11	3-4
F	30	10	1.5	1.5	1	2	1	0	8.5	7.5	12	12	3-4
F	23	9	1	1	2	2	1	1	9	9	9	18	3-4
F	19	8.5	1	0	2	1	0	1	8.5	8.5	9	24	3-4
F	15	8.5	0	2	2	2	1	1	10	12	6	25	3-4
F	27	9.5	1	1	2	2	1	0.5	11	10	10	26	3-4
F	16	8.5	0	0	1	1	1	1	7	7	12	30	3-4
F	18	9	1	1	1	2	0.5	1.5	9	11	8	32	3-4
F	20	9	2	1	1	2	1	2	10	11	11	33	3-4
F	32.5	10	1	1	3	2	1	1	13	11	10	4	2-16
F	26	9	1	2	1	2	1	2	11	15	10	5	2-16
F	26	8.5	0	1	1	1	0	1	7	7	9	7	2-16
F	25.5	9.5	1	1	1	2	1	0	12	8	9	163	2-21
F	33	10	1	1	2	1	1	1	11	10	12	164	2-21
F	30	10	1	1	2	3	1	0	11	10	11	165	2-21
F	34.5	10.5	0	0	1	1	1	0.5	7.5	5.5	10	166	2-21
F	24	9	1	1	1	2	1	0	7	8	7	168	2-21
F	33	9.5	1	1	1	1	1	1	9	11	11	171	2-21
F	26	9.5	1	1	1	1	1	1	9	7	11	175	2-21
F	31	10	3	2	2	1	1	1	14	12	12	176	2-21
F	25	10	2	1	2	2	2	1	13	11	13	177	2-21
F	37	10.5	0	0	2	2	1	1	10	10	7	178	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
F	31.5	9.5	0	0	2	1	1	1	7	7	4	182	2-21
F	24	9	1	1	1	1	1	0.5	9	8	9	186	2-21
F	19	8	1	1	1	2	1	1	9	11	9	188	2-21
F	22	8.5	0	0	2	2	1	0	8	7	7	189	2-21
F	28	9.5	2	1	2	2	1	1	12	10	11	192	2-21
F	29.5	10	1	0.5	2	1.5	0	1	7	7	6	199	2-21
F	23.5	9	1	1	1.5	2	1.5	1	8	9	2	200	2-21
F	21	9	3	1	2	2	1	0	13	9	4	201	2-21
F	27.5	9	1	1	1	2	1	1.5	9	10	10	203	2-21
F	30.5	10	1	2	1	1	1	1	12	11	10	204	2-21
F	25	9.5	0	1	1.5	2	1	1	9	12	9	207	2-21
F	23.5	9	0	0	3	2	1	1	5	5	3	208	2-21
F	32	9.5	1.5	0.5	1	1	1.5	0	8.5	7.5	10	210	2-21
F	26	9	0.5	0.5	2	1	1	0.5	8.5	7.5	6	211	2-21
F	22.5	8.5	2	1	3	1	1	1.5	12	10	6	214	2-21
F	27	9.5	0.5	1.5	2	2	1	0.5	8.5	10.5	7	216	2-21
F	22.5	8.5	0	0	3	2	1	1	12	9	11	217	2-21
F	28	9.5	1	1	2	3	2	1	13	15	10	220	2-21
F	25	9	1.5	0.5	2	1	1	1	10.5	7.5	12	222	2-21
F	18	9	1	0	1	1	1	1	8	6	7	230	2-21
F	23	9	1	1	1	2	1	1.5	10	12	10	231	2-21
F	37	10.5	2	1	2.5	3.5	2	1	11.5	12.5	13	232	2-21
F	24	9	1	1	2	2	2	1	10.5	10.5	12	237	2-21
F	23	9	1	0	1	1	1	0.5	7	6	8	239	2-21
F	30	10	0.5	1.5	1	1	1	1	9.5	11.5	9	240	2-21
F	25	9	0	0.5	1.5	1.5	0.5	1	8	7	8	241	2-21
F	30	9.5	2	1	1	2	1	1	7	10	8	246	2-21
F	21.5	8.5	1	1	2	2	0	1	8	9	6	247	2-21
F	19	8.5	1.5	0	2.5	1	0	1	8	7	9	249	2-21
F	22	9	1	1	1	1	1	0.5	9	7	9	251	2-21
F	26.5	9.5	1	2	3	2	0	1	10	11	10	252	2-21
F	19	8	0.25	1.25	2.25	2.25	1	1.5	8.5	10.5	9	258	2-21
F	24.5	9	0	0.5	2	2.5	1	1	10	11	10	261	2-21
F	20.5	8.5	2.5	1.5	2	2	1	2	12.5	14.5	9	264	2-21
F	23.5	9	2	2	1	1	1	1.5	11.5	9.5	10	267	2-21
F	30	9.5	1	1	2.5	2	1	1	11	9	15	269	2-21
F	34.5	10	1	0	1	1	0.5	0	7	6	8	270	2-21
F	35	10	1.5	1.5	1	1	0.5	1.5	10.5	10.5	10	271	2-21
F	21	8.5	1	0	1	1	1	1	8	6	5	272	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
F	30.5	9.5	2	0	2	2	1	2	8	9	11	273	2-21
F	24	8.5	1	1	1	1	1	1	8	8	11	274	2-21
F	15	7.5	2.25	2.25	1.25	1.25	1.5	1.5	9	9	9	275	2-21
F	34	10	1	0	0	1	2	1	9	8	7	276	2-21
F	35	10	2	2	2	2	1	2	11	12	14	277	2-21
F	29	9.5	1	0	2	2	2	1	10	10	10	278	2-21
F	28	9	1	1	2	2	1	1	12	9	7	279	2-21
F	24	9	1.5	1.5	3	2	1	1	11.5	10.5	7	280	2-21
F	23.5	8	1	1	2	1	2	1	10.5	8.5	7	281	2-21
F	26	9	1	0	2	2	0.5	1	10	10	11	282	2-21
F	27	9	4.5	1.5	1	2	1	1	12.5	14.5	9	283	2-21
F	25	9	0.5	0.5	1	3	1	1.5	7.5	11.5	11	284	2-21
F	25	9	2	1	1	2	1	1	9	10	9	285	2-21
F	32.5	10	1	1	2	1	0	1	10	7	13	286	2-21
F	30.5	9	3	1	2	2	0.5	1	14	12	12	288	2-21
F	30	9.5	2	1	1.5	2	1.5	0.5	11	10	13	289	2-21
F	19	8.5	1	1	2	1	2	0	11	9	11	291	2-21
F	32	10	1	1	1	1	1	1	7.5	6.5	9	293	2-21
F	27.5	9	1	1	1	2	1	1	7	8	9	294	2-21
F	21	8.5	1.5	1.5	2	1	1	2	9.5	9.5	10	295	2-21
F	32	10	1	1	2	3	1	1	7	10	7	296	2-21
F	29	9	1	2	2	2	2	1	13	10	11	297	2-21
F	32.5	10	1	0	1	2	1	1	7	7	7	298	2-21
F	23	9	1	1	1	2	1	2	9	11	9	299	2-21
F	27.5	9	2	1	1	2	1	2	10	11	11	301	2-21
F	23	8	1	1	1.5	2	1.5	1	11	10	10	302	2-21
F	32	10	0	0	1	1	1	1	7	7	5	305	2-21
F	23	8.5	1	0	1	1	1	1	9	9	12	306	2-21
F	30.5	9	0	0	1	1	1	1	7	9	10	307	2-21
F	25	9	1	0	2	2	1.5	1	9	9	8	311	2-21
F	35	10	0.5	0.5	3	2	1	1	15.5	9.5	17	312	2-21
F	27	9	1	1	2	2	2	1	12	10	15	318	2-21
F	31	9.5	1	1	1	2	2	0.5	10	9	9	323	2-21
F	26	9	0.5	0.5	2	1	0	1	6.5	5.5	9	329	2-21
F	27.5	9.5	1	1	2	1	0	1	11	10	10	332	2-21
F	27	9	1	1	2	2	1	1	12	12	12	333	2-21
F	24	9	1	1	2	2	1	1.5	10	9	11	336	2-21
F	23	8.5	1	1	1	1	1	1	10.5	8.5	7	342	2-21
F	24.5	8.5	1	1	1	2	1	2	11	14	14	347	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
F	19	7.5	1	1	1	2	2	1	9	10	12	348	2-21
F	25	9	0	1	1	2	1	1	8	8	10	361	2-21
F	28.5	9.5	1.5	1	2.5	2	1	1.5	14	13	12	362	2-21
F	17	8	1	1	2	2	0.5	1	12	10	6	364	2-21
F	22	8	0	0	2	2	1	1	10	10	7	366	2-21
F	21	8	1	1	1	2	0	1	7	7	5	367	2-21
F	47.5	11	0	0	3	3	1	2	14	12	11	9	2-21
F	25	9	1	1	1	2	1	1	8	9	8	18	2-21
F	19	9	1	1	1	1	1	1	9	9	7	21	2-21
F	31	9.5	1	1	2	2	1	1	11	10	9	22	2-21
F	23	9	1	2	2	2	1	2	11	13	15	23	2-21
F	32	9	0	0	2	2	1	1	9	10	11	25	2-21
F	30	9	1	1	2	1.5	1	1.5	13	13	14	29	2-21
F	26	9	1	1	2	2	0	0	9	9	8	35	2-21
F	26	9	1	2	2	2	1	1	9	12	10	44	2-21
F	29	9.5	0	1	2	2	1	0.5	10	11	9	47	2-21
F	30.5	9.5	1	1	1	2	1	0.5	8	9	10	48	2-21
F	25	9	0.5	1	1	2	1	2	9.5	13.5	11	50	2-21
F	22	8.5	1	0	2	1.5	1	1.5	11	9	11	54	2-21
F	26	9	1	0	2	1	0	1	8.5	8.5	9	59	2-21
F	24	9	1	1	1	1	1	0	7	7	8	65	2-21
F	26	9	1.5	1.5	1	2	0.5	0.5	8.5	8.5	11	68	2-21
F	26	9	1	1	2.5	1	1	1	9	8	9	69	2-21
F	25	8.5	1	1	2	1	1	1.5	10.	11	12	70	2-21
F	23	8.5	1	1	1	2	1	1	8	10	8	71	2-21
F	18	9	2.5	3.5	2	1	1	0.5	11	12	11	79	2-21
F	34	10	1	0	1	1	2	1	12	8	12	81	2-21
F	21	9	1.5	1.5	1	1	1	1	12.5	10.5	11	82	2-21
F	17	9	0.5	0.5	3	1	1	1	11.5	8.5	11	83	2-21
F	21.5	9	1	1	2.5	2	1.5	1	10	9	11	84	2-21
F	20	8.5	1	0	2	2	1	0	10	9	7	85	2-21
F	17	9	1	1	1	2	1	1	8	9	12	86	2-21
F	29	10	0	0	2	1	1.5	1	9	8	11	88	2-21
F	21.5	9.5	0	0	2	3	1	1	9	9	11	89	2-21
F	20	8.5	1	1	2	2	2	1	12	9	12	90	2-21
F	25.5	9	0	1	2	1	0	1	6	8	7	91	2-21
F	27	10	0	0	1	2	1	0.5	9	9	10	92	2-21
F	25	9	1	1	2	1	1	1	11	8	8	5	2-21
F	31.5	9.5	1	1	2	0	1	1	11	11	8	9	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
F	21.5	8.5	0	0	1	1	1	1	7	7	5	12	2-21
F	25.5	9	0	1	2	2	1	1	10	11	5	24	2-21
F	34.5	9.5	1	1	2	2	1	1	11	11	10	25	2-21
F	23.5	8	1	0	1	1	1	0	8	6	6	27	2-21
F	26	9	1	1	1	1	1	1	10	9	5	28	2-21
F	28.5	9	1	1	2	2	1	1	9	10	11	29	2-21
F	23.5	9	0	0	2.5	2	1	1.5	7.5	6.5	6	32	2-21
F	26	9	0	0	1	1	1	1	8	11	12	38	2-21
F	26.5	9.5	1	1	1	1	1	1.5	10	6	6	47	2-21
F	32.5	9.5	0	1	2	2	1	2	9	10	11	52	2-21
F	28.5	9.5	1	1	2	3	1	1	10	11	12	53	2-21
F	26	9	0.5	0.5	2	2	1	1	8.5	8.5	8	57	2-21
F	28.5	9.5	1.5	1.5	2	2	1.5	1	13	11	9	58	2-21
F	22	9.5	1	1	1	1	2	1	9	8	11	60	2-21
F	26.5	9.5	1	1	1	1	1	0.5	9.5	7.5	7	61	2-21
F	30	9.5	1	0	1	1	2	1	11	7	10	62	2-21
F	25	9	1	3	2	2	1	1	8.5	13.5	10	63	2-21
F	30	9.5	1	0	1	1	2	1	11	7	10	65	2-21
F	27.5	9.5	0.5	0.5	2	2	1	1.5	8.5	9.5	12	67	2-21
F	33.5	10	1	1	2	2	2	1	12	9	11	69	2-21
F	33.5	10.5	2	2	1	2	1.5	1	10	12	8	70	2-21
F	31.5	10	1	1	2	3	1	1.5	10	10	7	71	2-21
F	31	9.5	1.5	1.5	1	2	1	0	8.5	7.5	12	73	2-21
F	23	9	1	1	2	2	1	1	9	9	9	74	2-21
F	20	8.5	1	1	1	1	0.5	1	7	6	8	77	2-21
F	26.5	9.5	1	2	1	2	1	1	10	11	9	95	2-21
F	24	9	0	1	2	2	0	1	6	8	7	96	2-21
F	29.5	10	2	2	3	2	1	1	13	11	8	97	2-21
F	30	9.5	1	1	2	2	1	1	16	15	13	98	2-21
F	34.5	9.5	1	1	1	1	2	1	11	9	10	99	2-21
F	28.5	9.5	1	0	1	1	1	1	9	7	9	100	2-21
F	27.5	9.5	1	1	2	2	1	1	12	11	11	101	2-21
F	27.5	9.5	1	1	1	1	1	1	11	10	10	105	2-21
F	25.5	9	1	1	2	1	1	1	10	10	13	106	2-21
F	32.5	10	0	1	3	1	1	1	10	12	11	107	2-21
F	27	9	0	1	2	1	1	1	9	10	8	108	2-21
F	21	8.5	2	1	1	2	1	1	10	11	9	110	2-21
F	29.5	10	0	0	2	2	1	1	14	11	12	122	2-21
F	29.5	9.5	0	0	1	2	1	1	6	9	7	124	2-21

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
F	42.5	10.5	0	0	1	1	1	2	11	11	10	125	2-21
F	31	9.5	0	1	2	1.5	1.5	1.5	12	11	11	127	2-21
F	27	9.5	1	1	2	2	1	0	9	9	8	129	2-21
F	30.5	9.5	1	0	2	1	0	0	9	7	12	130	2-21
F	29	9.5	1.5	1.5	2	1.5	0	0.5	9.5	11	11	131	2-21
F	26	9	1	1	2	1	1	1	10	9	9	133	2-21
F	25	8.5	0	0	2	2	1	1	11	9	8	134	2-21
F	24.5	9	1	2	1	1	1	1	10	12	9	135	2-21
F	38	10.5	0	1	2	2	1	1	13	9	10	136	2-21
F	25	9.5	1	2	2	2	1	2	11	14	11	137	2-21
F	40	10.5	1.5	2.5	1	3	1	1	13.5	15.5	10	139	2-21
F	35.5	10.5	2	1	2	2	1	1	15	11	13	146	2-21
F	23	9	0	1	2	2	1	1	9	8	9	149	2-21
F	27.5	9.5	1	0	2	3	1	1	13	13	14	450	2-21
F	34	10	2	0	2	2	1	1	10	10	8	152	2-21
F	20	8.5	1	1	2	2	1	1	10	9	6	153	2-21
F	21	9	1	1.5	2	1.5	1	1	8	9	11	157	2-21
F	33	10	1	1	2	2	1	1	11	10	12	160	2-21
F	22	10	0	0	1	1	0	1	5	6	10	1	3-5
F	18	8.5	1	2	2	1.5	0	1.5	9	12	11	7	3-5
F	20	9.5	0	0	1	1	1	0	9	7	11	9	3-5
F	13	9	1	1	1	2	1	1.5	8	10	8	11	3-5
F	22	9.5	2.5	2.5	2	2	1	2	18	15	10	13	3-5
F	21.5	9	1	2	3	2	0.5	1	10	11	10	14	3-5
F	20.5	9	1	1	1	2	1	0	7	8	10	17	3-5
F	20.5	9.5	1	1	1	1	1	1	8	8	9	19	3-5
F	25	10	1	1	1	1	1	1	8	10	11	20	3-5
F	24.5	9	1	0	1	1	0.5	0.5	8	6	6	33	3-5
F	21	9	1.5	0.5	2	2	1	1	10.5	9.5	9	34	3-5
F	20	8.5	0	0	1	2	1	2	7	10	8	48	3-5
F	19	9.5	1	1	2	2	1	1	10	11	7	51	3-5
F	24.5	10	2	2	2	2	1	2	11	12	14	54	3-5
F	20.5	9	1	1	2	1	1	1	10	9	10	55	3-5
F	26	10	0	0	2	2	1	1	9	9	6	61	3-5
F	22	9.5	1	1	1	1	1	1	8	9	8	62	3-5
F	28.5	9.5	2	1	2	2	1	1	10	8	10	64	3-5
F	24	9.5	0	0	1	1	1	1	7	7	6	75	3-5
F	17	9.5	1.25	1.25	2.25	3.25	0.5	0.35	10.5	12.5	13	96	3-5
F	25	9	1	1	2	1	1	1	9	9	11	108	3-5

Appendix continued

SEX M/F	MASS (grams)	SVL (cm)	SP. HD. F.L.	SP. HD. F.R.	SP. HD. R.L.	SP. HD. R.R.	SP. NK. L.	SP. NK. R.	SP. SV L.	SP. SV R.	SP. T.	PIC #	DATE 2003
F	20.5	9.5	1	1	2	2	1	1	9	11	11	112	3-5
F	15	8.5	1	2	1	1	1	0	9	10	13	114	3-5
F	18.5	9	0.5	1	2	1.5	1	0.5	11.5	9.5	13	115	3-5
F	24	10	1	1	2	3	1	1	10.5	11.5	14	117	3-5
F	20.5	9	1	1	2	1	1	1.5	10	11	12	119	3-5
F	20.5	10	0	0	1	1	1	1	8	6	7	123	3-5
F	24	9	1	1	3	3	1	1.5	16	13	13	125	3-5
F	21	8.5	0.25	1.25	2.25	2.25	1	0.5	9	11	8	126	3-5
F	19.5	9	0	1	2	2	0	0	8	9	8	127	3-5
F	25	10	0	0	2	1.5	0.5	1	8	9	10	128	3-5
F	24	10	1	1	2	1	0	1	10	8	13	129	3-5
F	18.5	9	1	1	2	1	1	0	10	8	11	130	3-5
F	18	8.5	1	1	2	1.5	0.5	1	12	9	7	138	3-5
F	22	9.5	1	0.5	2	1.5	0	2	7	8	6	139	3-5
F	18	9	2	1	2	2	1	1	12	10	11	140	3-5
F	27	9	0.5	0.5	2	1	1	1	8	8	5	143	3-5
F	25	9	1	1	2	1	1	0.5	10	7	8	144	3-5
F	23.5	9	1	1	1	1	1	1	10	12	6	145	3-5
F	15	8.5	0.5	1.5	2.5	1.5	1	1	9.5	9.5	9	148	3-5
F	18.5	8.5	0	1	1	1	1	1	9.5	9.5	10	150	3-5
F	22	9	0	0	1	1	1	0	7	9	10	151	3-5
F	20.5	8	2	1	2	2	1	1	11	9	5	153	3-5
F	27	9	1	1	2	1	1	1	13	8	5	154	3-5
F	19.5	8.5	3	1	1	2	0.5	1	11	12	10	19	3-15
F	19.5	9	0	1	2	1	1	1.5	9	10	10	46	3-15
F	26	10.5	3	2	1	2	1	2	12	15	12	47	3-15
F	27.5	10	0	0	2	2	0	1	9	9	9	48	3-15
F	19	9	1	0	1	1	1	0.5	8	6	6	49	3-15
F	19	9.5	1	1.5	1	1.5	1	1	9	8	16	7	3-15
F	21.5	9.5	1	1	2	2	0.5	0	11	8	9	10	3-15
F	16	9	0	0	1	2	1	2	7	10	8	15	3-15
F	23	9.5	1	1	1	4	2	2	12	15	17	18	3-15
F	20	9	1.5	1.5	2	2	2	1	12.5	11.5	13	19	3-15
F	21	9	1	1	2	2.5	1	1	9	10	10	23	3-15
F	22	8.5	0	0	2	2	0.5	1	10	9	8	28	3-15
F	16	8.5	0	0	2	1	2	0.5	9	6	9	29	3-15
F	23	9.5	1	2	1	1	0.5	0.5	8.5	8.5	8	30	3-15
F	21.5	9	1.5	1.35	2	2	1	1	14.5	10.5	10	34	3-15
F	30.5	10	1	1	1	2	1	1	10	11	10	35	3-15

VITA

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